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X-Ray Reflectivity Studies of Alkane Structures at the Vapor/Water Interface.

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Introduction: Layer formation of normal alkanes, which are linear hydrocarbon chains, on water surface is of fundamental relevance to a number of physical principles such as long-range van der Waals forces and critical behaviors, yet the results are still controversial.

Methods and Materials: We used X-ray reflectivity to study the adsorption of linear alkanes (octane and hexane) directly at the vapor/water interface in a thermally equilibrium state at $T = 25^{o}$C. Perduterated alkane (octane-d_{18}) was also used to address the isotopic effect between normal alkane and its isotope, which is commonly used for neutron measurements.

Results and Conclusions: Time dependence allows us to study the wetting dynamics, by monitoring that the alkane vapors, transported from a neighboring alkane reservoir, form a layer at the interface. Figure 1 shows that octane-d_{18} forms a microscopic wetting layer. The results reveal that the thickness of octane-d_{18} increases up to 17Å, which is in contrast to the previously reported non-wetting structures of non-deuterated octane such as lenses, or submonolayer. Data analysis of other alkanes is still in progress.

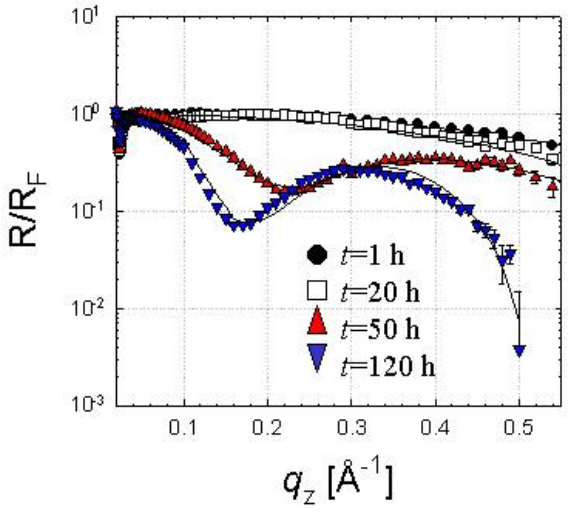

Figure 1. X-ray specular reflectivity measurements of octane-d_{18} at the vapor/water interface at $T = 25^{o}$C. The solid lines are the least square fits.